

WF-8950L2PEC Li-Ion Power Center



THE HEARTBEAT OF TODAY'S RVs

Distributed in the U.S.A. and Canada by
ARTERRA DISTRIBUTION

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EXPERT PRODUCT SUPPORT

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⚠ WARNING
RISK OF ELECTRICAL SHOCK Disconnect or isolate all power supplies before making electrical connections. More than one disconnection or isolation may be required to completely de-energize equipment. Contact with components carrying hazardous voltage can cause electric shock and may result in severe personal injury or death.
NOTICE
All wiring must conform to local, national, and regional regulations. Use copper conductors only for all wire connections. Do not exceed the electrical ratings for the WF-8900 Series Power Center as this may cause equipment failure and/or electrical shock which may result in severe personal injury or death.
⚠ CAUTION
EQUIPMENT SERVICING This product should be installed by an experienced certified technician. CAUTION and care must be taken when servicing this equipment. To prevent severe shock or electrocution, consult your servicing dealer.
⚠ WARNING
SPARK HAZZARD This unit employs components that can produce arcs or sparks. To prevent fire or explosion, do not install in compartments containing batteries or flammable materials (LP gas). This product is NOT ignition protected.
⚠ CAUTION
DO NOT OBSTRUCT VENTILATION OPENINGS To prevent fire, DO NOT cover or obstruct enclosure ventilation openings. DO NOT mount the WF-8935, WF-8945 or WF-8955 units in a zero-clearance compartment as overheating may result. These units require a 2 cubic foot (min) vented area behind the unit for cool air exchange.
⚠ WARNING
BATTERY SYSTEM Use converter only on appropriate battery systems. Other usage may cause personal injury and damage. Consult all battery manufacturer's recommendations for additional safety information before use.

The WF-8950L2PEC Power Center should only be used with lithium batteries. The use of this device to charge a non-lithium battery may cause that battery to become overcharged.

GENERAL INFORMATION

WF-8950L2PEC Li-Ion Power Center Safety Features

Reverse Battery Protection

The WF-8950L2PEC Li-Ion Power Centers will charge the 12-volt House battery if installed. A battery DOES NOT have to be installed for WF-8950L2PEC Li-Ion Power Center converter operation. When a battery is installed, two reverse polarity fuses protect the converter circuitry. The fuses are located along the left-center edge of the DC fuse board below the VCC+ lug. Refer to Figure 1 below. This feature prevents permanent damage to the converter from a battery connected into the circuit backwards. In addition to protecting the converter section, the reverse polarity fuses are the main connection between the converter and the DC fuse board.

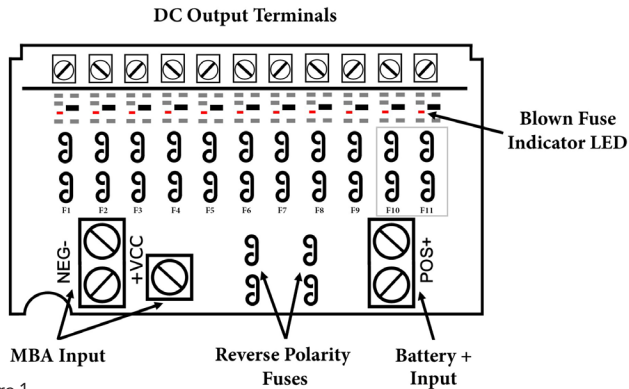


Figure 1

Blown Fuse Indicators on DC Fuse Board

The DC Fuse Board has individual blown fuse indicators as standard equipment. Each of the 11 DC fuse circuits contain a Red LED to indicate a blown fuse. If one of the circuits draws more current than the rating of the fuse, the fuse will blow. When this occurs, the Red LED for that circuit will illuminate. **NOTE:** The fuse board employs surface mount LEDs which are barely visible to the naked eye. Replace the blown fuse with a known good fuse of the same rating. **NOTE:** If the replacement fuse blows again, check that circuit for a short or overload condition.

Automatic Cooling Fan

The cooling fan in the WF-8950L2 Li-Ion Power Center is incremental and is controlled by the current drawn out of the converter to the applied load. The on-board microprocessor increases fan speed as the total load increases and decreases fan speed as the load decreases. Unlike traditional temperature-controlled fans, the load-controlled fan provides better component cooling by avoiding temperature spikes which can lead to premature component failure.

Over-Temperature Protection

If the internal temperature of the converter exceeds a critical point, it will shut down. This protects the unit from excessive heat that may damage sensitive components. The unit will restart once the temperature inside has dropped.

Electronic Current Limiting

In the event that the output current exceeds the maximum rating for the WF-8950L2 Li-Ion Power Center converter, the output current will remain constant, but the output voltage will begin to drop. If this occurs, the unit will recover once loads are reduced.



Short-Circuit Protection

Should a short circuit occur in the RV, the WF-8950L2 Li-Ion Power Center converter will drop the voltage output to zero volts. If the short-circuit condition is removed and no other fault conditions are detected, the converter will resume normal operation. However, short-circuit conditions are **dangerous**, and an RV will require inspection by a qualified service technician.

CIRCUIT PROTECTION

WF-8950L2PEC Li-Ion Power Center Fuses and Breakers

DC Fuses (12 Volts)

The DC fuse board has spaces for eleven DC circuits, and two Reverse polarity fuses. This includes nine 20 Amp circuits (positions F1 to F9), two 30 Amp circuits (positions F10 and F11 to be used for slide-outs or other higher current loads) and two 40 Amp Reverse Polarity fuses. The circuit fuses and the Reverse Battery Protection fuses should be replaced with ATC or ATO automotive type fuses such as:

- Littelfuse type 257
- Bussmann type ATC

AC Circuit Breakers (120/240 Volts)

The AC Breaker side of the WF-8950L2 Li-Ion Power Center is located on upper the left side. The WF-8950L2PEC Li-Ion Power Center accepts standard residential breakers. A total of ten breakers can be installed: one 30 Amp Main breaker and up to a maximum of nine AC Branch circuits when using duplex breakers. Installation requirements may vary. Please refer to the appropriate electrical code to ensure the safety of your installation. A list of factory tested and approved breakers follows. The breakers may be purchased at most big-box department stores and home centers.

UL-Listed Main Circuit Breakers, Rated for 120V, Maximum 30A

The following breakers have been factory tested and approved for use as 30 Amp Main breakers in the WF-8950L2PEC Li-Ion Power Center:

Manufacturer	Model/Cat. No./Type
Cutler Hammer	Type BR and C
Thomas Betts	Type TB or TBBD
ITE/Siemens	Type QP or QT
Square D	Type HOM or HOMT
Murray	Type MP-T or MH-T
General Electric	Type THQL

UL-Listed Branch Circuit Breakers, Rated for 120V, Maximum 20A

The following breakers have been factory tested and approved for use as Branch breakers in the WF-8950L2PEC Li-Ion Power Center:



Manufacturer	Model/Cat. No./Type
Cutler Hammer	Type BR and C, Type BRD, BD and A
Thomas Betts	Type TB or TBBD
ITE/Siemens	Type QP or QT
Square D	Type HOM or HOMT
Murray	Type MP-T or MH-T
General Electric	Type THQL

When replacing any of the installed circuit breakers, the replacement should be of the same manufacturer, type designation, and equal interrupting rating, not to exceed 30 A. The "Short-Circuit-Current" rating for the breaker should be 10,000 Amps.
 Breaker Filler Plates: Model #FP-01 or FP-01B (Black)

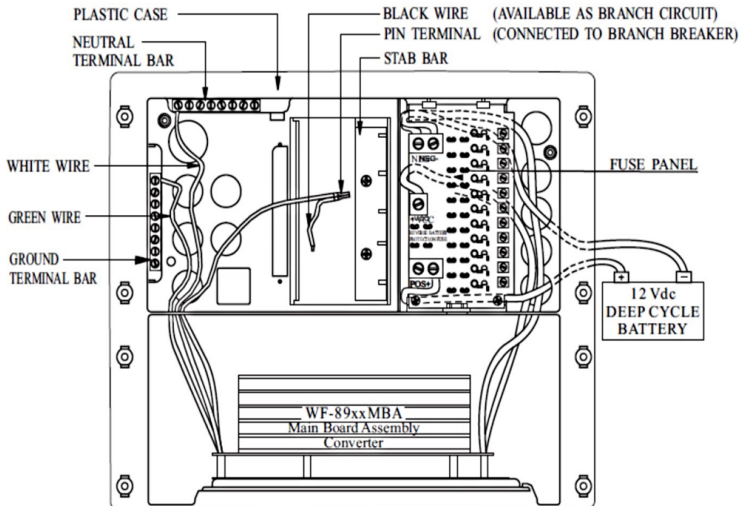


Figure 2

OPERATIONAL FEATURES

Converter Operation Modes



Two-Stage Smart Charging

The two-stage "smart" charger continuously measures the battery voltage output and regulates the amount of charge using two modes of operation; Bulk, and Absorption modes.

Converter Modes of Operation

Understanding output voltages of a two-stage converter.

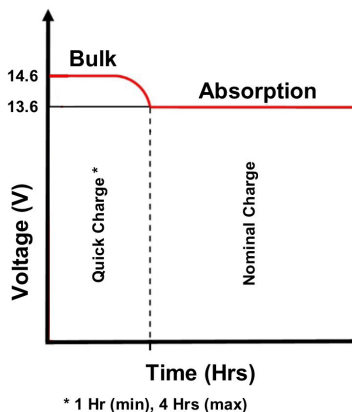


Figure 3

The above graph is based on a 100 Amp-Hour battery. Any battery installation greater than 100 Amp-Hours may require additional cycling by momentarily removing the RV's 110 VAC power then reapplying 110 VAC power.

Bulk Mode

This mode is designed with 2 purposes in mind. First, to quickly restore the energy back into the battery. Second, to ensure the lithium cells inside the battery remain balanced. This is accomplished by boosting the output voltage to 14.6VDC and allowing the maximum current to flow as required by the loads.

The bulk mode stage could last anywhere from 1 to 4 hours based on the battery and load current which is being used. For a full battery, the bulk stage has a minimum time requirement of 1 hour, which allows the lithium cells inside the battery the time required to "balance". For an empty battery, the bulk stage has a maximum time requirement of 4 hours. If your application requires longer than 4 hours (such as a larger battery bank > 200 Ahr), a simple cycling of power will reset the timers.

As the energy is restored into the battery, the DC system voltage will climb and the current from the converter will decrease. If the total amperage draw from the converter reaches a preset point (within the 1-4 hour timer), the converter is designed to drop out of bulk mode.

Absorption Mode

This mode is designed with 1 purpose in mind. This purpose is to provide a safe operating voltage for all loads in the RV. This is accomplished by reducing (from bulk mode) the output voltage to 13.6VDC and remaining at this voltage until the power is cycled to the converter.

The absorption mode stage is the default or normal mode of operation, which has no timer associated with it. In this mode an output of 13.6 VDC is provided to the DC circuits in the RV. This voltage has a long-term history as the acceptable voltage for all loads in the RV, and should not place undue stress (nor reduce the longevity) of the lights and appliances in the RV. This is not to say that all loads will have an issue with a constant higher voltage; however, some loads may have an issue. Please refer to the individual manufacturer's specifications for acceptable operating voltage range of the connected load.



TROUBLESHOOTING INSTRUCTIONS

Troubleshooting the WF-8950L2PEC Li-Ion Power Center

Refer to the Troubleshooting Guide for the WF-8950L2PEC Li-Ion Power Center (Figure 4) below.

Converter Output Voltage

Before checking the WF-8950L2-MBA output voltage, disconnect the battery cables at the battery. Make sure the converter is plugged into an AC source (105-130 Volts). Check the converter output voltage at the battery with a voltmeter. Place the meter probes on the disconnected battery cables; place the Positive (red) meter probe on the + Positive red battery wire and place the Negative (black) meter probe on the - Negative black wire on the battery cable. Be sure you have good connections at the cables. If the voltage reads 13.6 - 14.6 VDC (+/- 0.2) with no load, the converter is functioning properly.

If the converter output voltage at the battery reads 0.0 VDC, or if the battery is not charging, check for an open inline fuse in the battery wire circuit. One may have been installed by the RV manufacturer. Also check for loose wiring connections.

DC Reverse Polarity (Fuses)

If there is no DC output coming from the WF-8950L2PEC Li-Ion Power Center converter section, first check the reverse polarity fuses on the fuse board. Then, visually inspect the fuses for any breaks in the fuse element. If no breaks are found, use a continuity tester to check for continuity. If the reverse polarity fuses are blown, it means the RV battery was accidentally connected in reverse, either at the battery or at the converter. Investigate the connections and reconnect the cables properly. Replace the fuse with the same type and amperage rating as the original.

IMPORTANT: These fuses protect the converter from damage in the event that the RV battery is accidentally connected in reverse. A reversed battery connection, even if for only a second, will cause these fuses to blow.

If the above checks have been made but the converter output still reads 0.0 VDC, the converter is not functioning properly. Contact the Arterra Distribution Power PROs at 1 (877) 294-8997. Before placing the call, please have available the WF-8950L2PEC Power Center model number from the front panel label and the 14-digit serial number from the bar code tag located on the MBA mounting plate.

AC Reverse Polarity (Audible Alarm)

This power center is equipped with an AC REVERSE POLARITY PROTECTION feature. Should the incoming AC neutral wire and lead wire be connected backwards at the power center, an alarm located in the power center enclosure will sound. This alarm will continue to sound until the AC wires are connected correctly.

Troubleshooting Guide for the WF- 8950L2PEC Li-Ion Power Center

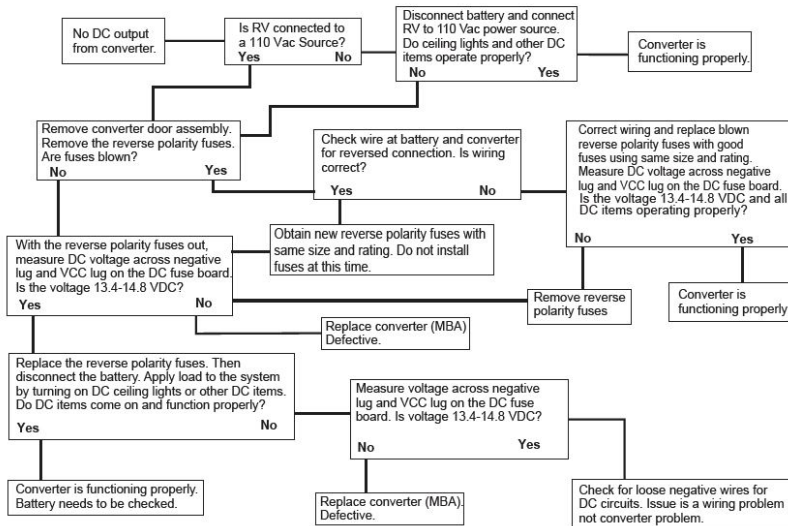


Figure 4

Should it be determined that the converter section of the WF-8950L2PEC Li-Ion Power Center needs to be replaced, removal of the Main Board Assembly is a simple process.

INSTALLATION INSTRUCTIONS

Replacing the WF-8950L2PEC Li-Ion MBA

⚠ WARNING

RISK OF ELECTRICAL SHOCK

Disconnect or isolate all power supplies before making electrical connections. More than one disconnection or isolation may be required to completely de-energize equipment. Contact with components carrying hazardous voltage can cause electric shock and may result in severe personal injury or death.

Make sure no AC power is coming into the RV from either the Shore Power cord or an on-board generator. Remove and set aside the Reverse Polarity Fuses to disconnect the converter section from the rest of the RV DC power.

Perform the following steps:

1. Remove the door assembly by loosening the two screws located in the upper left and right corners. The screws are captive and will not fall out. Pull forward and outward on the door assembly to clear the case.
2. In the upper left portion of the fuse board, loosen the NEG- lug (White wire) and the VCC+ lug (Red wire). Do not back the lug screws all the way out.
3. Locate the tab at the bottom of the fuse board holding the board in place. Gently depress the tab allowing the fuse board to be pulled forward.
4. With the fuse board pulled slightly away from its mounting, pull the Red and White wires out of the lugs.



5. In the AC section of the enclosure, locate the Black wire coming up from the converter in the lower section. As an extra precaution, **MAKE SURE THE CONVERTER BREAKER IS IN THE OFF POSITION**. Remove the wire from the breaker. NOTE: this wire has a metal pin terminal on the end inserted into the breaker. Remove and position out of the way any wire connected to the pigtail.
6. Locate and remove the converter's Green Ground wire attached to the AC Ground bar on the left side of the compartment. In a similar fashion, locate and remove the converter's White Neutral wire attached to the AC Neutral bar at the top of the compartment.
7. In the converter compartment, remove the two screws at the front of the MBA holding it in place. Slide the MBA forward routing the wires through the slots in the case until the MBA clears the enclosure.

If the MBA is being returned under a warranty claim, follow the packaging instructions in your warranty claim packet.

When installing a replacement MBA, reverse the order of steps 1-7. Make sure all wiring connections are torqued to the proper values found in the torque chart located on the back of the door assembly.

GENERAL COMPLIANCE INFORMATION

Agency Listings

UL

The WF-8950L2PEC Li-Ion Power Centers are UL-Listed, and cUL-Listed (Canadian).

FCC Compliance Class B

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

INSTALLATION INSTRUCTIONS

Installing the WF-8950L2PEC Li-Ion Power Center

Mounting the Enclosure

The WF-8950L2PEC Li-Ion enclosure should be mounted in an accessible area such as a wall or in the side of a cabinet. The front of the enclosure should not be obstructed to allow free air flow for the cooling fan. The enclosure will slide into a rough opening of 12 3/16" W x 10 7/8" H. The enclosure depth is 7 1/4". After wiring is completed, the enclosure fastens to the wall or cabinet using 8 wood screws (not supplied).

⚠ WARNING

RISK OF ELECTRICAL SHOCK

Disconnect or isolate all power supplies before making electrical connections. More than one disconnection or isolation may be required to completely de-energize equipment. Contact with components carrying hazardous voltage can cause electric shock and may result in severe personal injury or death.

Wiring the AC Breakers

Make sure no AC power is coming into the RV from either the Shore Power cord or an on-board generator. Determine the proper size breakers for the loads the WF-8950L2PEC Li-Ion Power Center will be powering. You can use either single or duplex breakers, or a combination of both. We recommend that all the breakers used be of the same brand. When using duplex style circuit breakers, a total of 10 breakers can be mounted in the WF-8950L2PEC Li-Ion Power Center: 1 Main breaker and 9 Branch breakers. Refer to the tables on pages 5 and 6 for a selection of approved breakers. The Main breaker should be 30 Amp and is to be installed in the top-most position. See the wiring diagram below. A hold down clip is provided to keep the breaker securely in place.

The 30 Amp power cord is routed through the large knockout in the wiring compartment and secured with a Romex clamp. The Black (Hot) wire is connected to the 30 Amp Main breaker as shown. The White (Neutral) wire is connected to the Neutral Terminal bar at the bottom of the wiring compartment. The Green (Ground) wire is connected to the Ground Terminal bar also located at the bottom of the compartment.

Route the Romex leads for the Branch circuits through the Strain Reliefs in the back of the wiring compartment. In a similar fashion, connect the Black wire to the Branch breaker and the White and Green wires to the appropriate Terminal bar. Also, route an 8 AWG Green or bare Ground wire through the small diameter hole located next to the Ground bar to the vehicle chassis.

The Black power wire for the converter has a pigtail connection. The metal pin is inserted in the Branch breaker designated for converter power. The end with the wire nut can be used to power another circuit if necessary. If not used, leave the wire nut installed and push the wire to the side. Make sure all terminals are torqued to the specifications listed on the back of the door assembly.

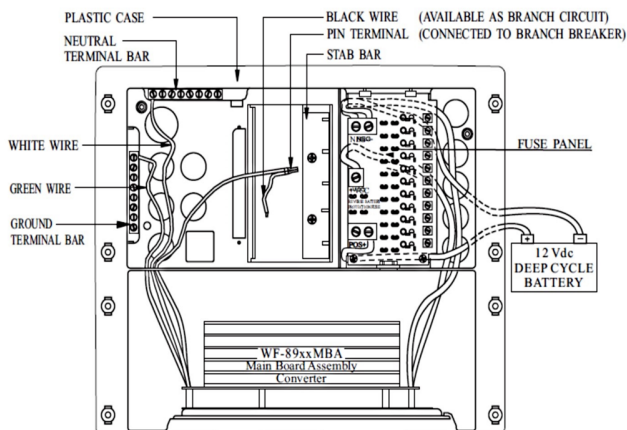


Figure 5

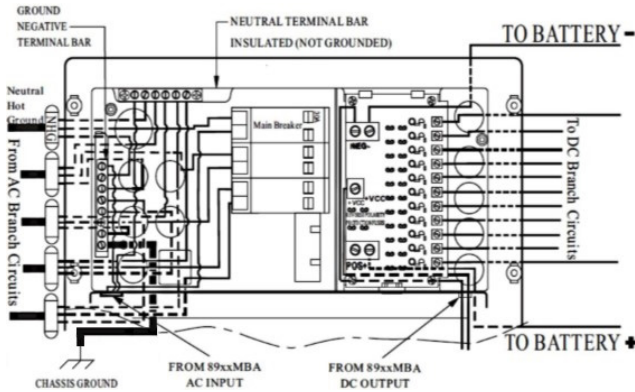


Figure 6

Wiring the DC Fuse Board

Make sure the house battery is disconnected before beginning the DC wiring. Determine what DC loads are to be connected to the fuse board and what position they will occupy. Circuits F10 and F11 can be used for slide-outs or other higher current loads and can have a maximum 30 Amp ATO or ATC fuse installed. The remaining circuits are general purpose and can have up to 20 Amp ATO or ATC fuses installed. Make sure the fuses are seated properly.

For models with output screw terminal connections, strip approximately 1/4" of insulation from the load's wire and insert into the screw terminal. Tighten the terminal to the torque specified on the back of the enclosure.

For models with WAGO style terminal blocks, strip approximately 1/4" of insulation from the load's wire. Lift the lever and insert the wire. Firmly push the lever down to make the connection.

Connect the heavy wire (Red) coming from the battery to the POS+ lug located directly below the Reverse Polarity fuses. Make sure this lug is torque properly.

As a last step, install a separate bus bar in a location behind the converter. This bus bar can be purchased from a local home center or hardware store. Run an 8 AWG wire from the NEG- lug on the top left of the DC fuse board to this bus bar. Connect the battery negative wire to this bus bar along with all the negative DC load wires. Also, run a wire from the bus bar to chassis ground.

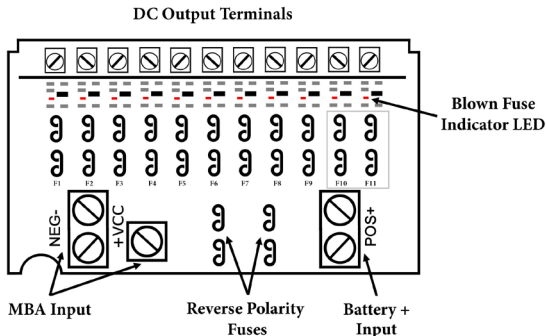


Figure 7

WF-8950L2 Lithium-Ion Power Center Specification*	
Model No.	WF-8950L2
Converter Input Power:	
Voltage:	105-130 VAC
Frequency:	60 Hz
Max. Input Current @105 VAC	11 Amps
Max Power	940 Watts
Converter Output Power	
Continuous Power:	730 Watts
Rated DC Output Voltage	13.6 - 14.6 VDC
Rated DC Current	60 Amps
Charging Control	Automatically controlled by microprocessor
Charging Modes	2-stage Intelligent charge
Intelligent Charge Mode	Absorption and Bulk
Battery Adaptability	Lithium-Ion
Absorption Charge Voltage	13.6 VDC
Bulk Charge Voltage: (4 Hrs)	14.6 VDC
Regulation	±1.5% accuracy against input or load changes
Cooling Fan	Two speed according to the DC load amperage
VA Efficiency:	> 80% (under 70% of load condition)
Protection:	
Overload	Current-limiting & shut down; auto recovery upon return to normal load
Short-Circuit	Shut down & auto recovery upon return to normal
Over-Temperature	Shut down & auto recovery upon return to normal
Battery Reverse Polarity	Protected by fuses; same rated fuse replacement required
AC Distribution	
Mains Rating	Max. 30 Amps / 120 VAC
Breakers	1 x 30 Amp Main and 9 branch using duplex breakers
Romex Strain Reliefs	None
DC Distribution Board	
Standard DC Output Loops	2 x 30 Amp, 9 x 20 Amp max. each
LEDs on Fuse Board	Total 11 chip-LEDs; Redindicating fuse blown status of individual loops
Visual Window	Special design transparent window for easy reading of LED status
Mechanical:	
Zero Clearance	None - requires 2 cu ft (min) vented area behind unit for cool air exchange
Dimension: W x H x D	14.17 x 11.81 x 8.5 inch / 360 x 300 x 216 mm
Cutout Size: W x H	12.2 x 11 inch / 310 x 280 mm
Weight:	7.75 lbs. / 3.9 kg
Environmental:	20 ~ 90% Non-condensing
Agency:	UL458 and FCC Class B compliant

* All specifications are based on a 100 Amp-Hour lithium battery.

Figure 8



CONSUMER LIMITED WARRANTY for WFCO Electronic Products

WFCO extends, to the original owner, a Two Year Limited Product Warranty. This warranty is in effect from the date of original purchase for a period of two (2) years. This limited warranty is extended specifically for and is limited to Recreational Vehicle application and is only valid within the continental United States, Alaska, Hawaii and the Provinces of Canada. WFCO warrants, to the owner, that its products are free from defects in material and workmanship under normal use and service based on its intended use and function. This warranty is limited to the repair or replacement, at WFCO's discretion, of any defective parts or defective assembly. Any implied warranties of merchantability or fitness for intended use are limited in duration unless applicable State Law provides otherwise. You may have other rights as specified by each individual state.

EXCLUSIONS and LIMITATIONS

The OEM warranty specifically does not apply to the following:

- Any WFCO product that has been repaired or altered by an unauthorized person;
- Any damage caused by misuse, faulty installation, testing, negligence, accident or any WFCO product installed in a commercial vehicle;
- Any WFCO product, whose serial number has been defaced, altered or removed;
- Any WFCO product, whose installation has not been in accordance to the WFCO written instructions;
- Any consequential damages arising from the loss of use of the product including but not limited to: inconvenience, loss of service, loss of revenue, loss or damage to personal property, cost of all services performed in removing or replacing the WFCO product. Specifications are subject to change without notice or obligation.
- Any WFCO Electronics products sold through unauthorized Internet sources (Example: eBay) will be excluded from all warranty coverage offered by Arterra Distribution / WFCO.

CONSUMER WARRANTY CLAIM PROCEDURE

Upon determination and validation by an authorized OEM dealer that a WFCO product has a defect, a Return Goods Authorization (RGA) number will be required before the product can be returned. The RGA number can be requested by completing the Warranty Information Fax Sheet and appropriate Troubleshooting Form found at www.wfcoelectronics.com. Once these forms have been completed, email the forms along with Proof of Purchase to warranty@wfcoelectronics.com or fax the three documents to the Warranty Department at (574) 294-8698. After receipt of the forms, an RGA number will be issued. This number shall appear on all correspondence with warranty service. Upon validation of the warranty, WFCO shall replace the product with a like product. The RGA number shall be placed on the outside of the carton used to return the product for ease of identification. Do not mark directly on the product. The product must be packaged properly to avoid further product damage which could cause a non-warrantable condition.

WARRANTY ASSISTANCE

The consumer may contact the selling Dealer or OEM for warranty assistance. The consumer may also contact Arterra Distribution, exclusive distributor to WFCO Products at: (574) 294-8997 or Fax (574) 294-8698.

Back Side of the WF-8950L2PEC Li-Ion Power Center

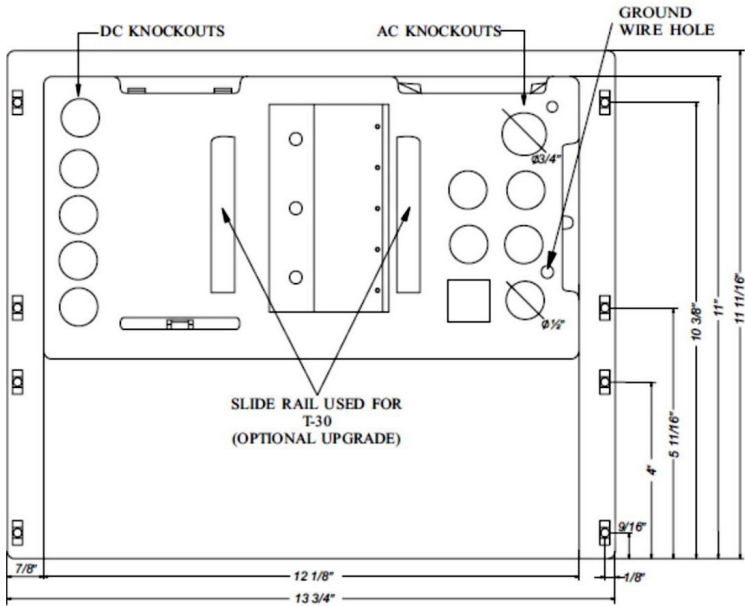


Figure 9



THE HEARTBEAT OF TODAY'S RVs

WFCOELECTRONICS.COM